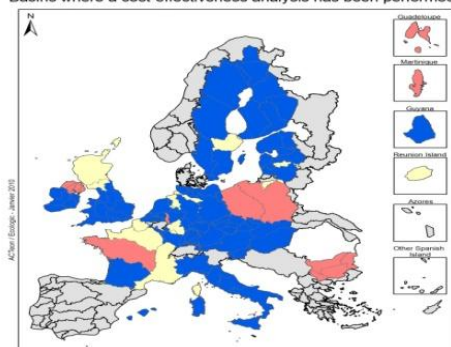


Basins where a cost-effectiveness analysis has been performed



Research project on the use of the Cost Effectiveness Analysis in regard to the European Water Framework Directive

Final report

January 2011

A study undertaken for Office National de l'Eau et des Milieux Aquatiques (ONEMA)

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ABBREVIATIONS

CBA	Cost Benefit Analysis
CEA	Cost Effectiveness Analysis
CER	Cost Effectiveness Ratio
EU	European Union
PoM	Programme of Measures
RBD	River Basin District
RBMP	River Basin Management Plan
WFD	Water Framework Directive

BACKGROUND

This report has been prepared by ACTeon on the basis of the data acquired by the International team of experts (ACTeon, Fresh-Thoughts, Enveco, Manuel Pulido Velazquez, IACO) on the use of the Cost Effectiveness Analysis in the context of the European Water Framework Directive in the 27 EU Member States. The information provided integrates the outputs of the 3 phases of the project and should be used as support for the steering committee of 21st December 2010 and as a basis for the final report.

The goal of this study, as defined in the terms of reference, is to establish an evaluation and overview of the application of the Cost Effectiveness Analysis in the implementation of the Water Framework Directive in France and in Europe. The following points are to be investigated:

- Degree of application of CEA in France and other Member States
- Role of CEA in decision-making
- Comparative analysis of the main methodological choices
- Recommendations regarding methodology and preconditions

SUMMARY

The Cost Effectiveness Analysis (CEA) is an instrument prescribed in the Water Framework Directive (WFD) to select the most cost effective measures. The results of the report show that the application of the CEA in Europe is quite diverse and is not applied consistently. The differences in scope of application and use in decision-making are primarily due to governance structures, political culture and availability of resources and data. There are different approaches in the European member states, with a North-West and South-East (except Spain) divide. While there are more activities (databases, research programmes, guidelines) in member states like e.g. the UK, Netherlands, Denmark and Germany, little could be found in e.g. Italy, Greece, Bulgaria and the Czech Republic.

Some countries use generic data while others rely on data transfer (external consultants or twinning partnership) or have to generate the information in situ. Some countries use CEA only in special sectors (e.g. only hydromorphology) or levels (e.g. only on water body level) whereas other countries try to apply CEA on multiple sectors and levels. There are countries with uniform (top-down) and countries with diverse (federal) applications due to the organisation of the CEA procedure.

It became clear, that CEA is generally not easy to undertake because of the lack and insecurity of data, especially on effectiveness of measures. The reasons for these problems lie in the complexity of estimating costs and effectiveness on different scales, over time and considering upstream/downstream dynamics of rivers and synergies. So far there are no global models to address all these issues. Instead, various models for pollutant load identification (e.g. for N and P estimation) were used in some studies.

When applied, CEA is mainly used for identifying the most cost efficient measure (-parcel) in the agricultural sector and, to a lesser degree, in the household and industry sector. Water quality, especially in surface water, is the predominant theme. Methodologically, a CE Ratio is the main tool for selection. The use of expert judgement is widespread, especially to estimate effectiveness. The CEAs found do often not refer to stakeholder participation, iterations in the process and cost distribution. Costs and effectiveness are, at times, defined quite narrowly (without e.g. transaction costs). The results of CEA are not always used; political acceptability and budget being the main problems. Nonetheless, efforts are underway in many member states to improve the CEA procedure.

In France, combinations of measures to achieve good ecological status were compared in some basins, as regards costs and potential financiers. The comparison of these scenarios has been the basis of decision making for the final Program of Measures. Moreover, French water agencies carry out comparisons of effectiveness and costs of their actions on a regular basis, as part of the continuous evaluation of their policies' efficiency.

1 INTRODUCTION

The Water Framework Directive (WFD) obliges the member states in Europe to elaborate a Programme of Measures (PoM) in order to achieve good water quality. For the selection of these measures the criteria of cost efficiency has to be applied. Article 11, Annex 3 of the WFD (EC, 2000) states:

“The economic analysis shall contain enough information in sufficient detail (taking account of the costs associated with collection of the relevant data) in order to:

(a) [...]

(b) make judgements about the most cost-effective combination of measures in respect of water uses to be included in the programme of measures under Article 11, based on estimates of the potential costs of such measures.”

In various reports (e.g. Dutch guidelines, Ministrie van Verkeer en Waterstaat (2005), Report on CEA from the Ministry for Environment, Lower Saxony/Germany (2010)) it has been stated that the specifications for the use of Cost Effectiveness Analysis (CEA) in the WFD have been quite vague. Thus, the respective member states have some leeway in designing their response to ensure that cost effectiveness is considered in the PoM. At the same time, the undertaking of a CEA poses some challenges for many of the countries because it is a new and unfamiliar economic approach in terms of practical water management.

The topic itself has not been subject to much research. According to Berbel et al. (2010), there is still scarce literature on the use of CEA in the specific context of the WFD. Recently, it has been highlighted that several elements of the CEA performance could be improved for the next PoM 2015-2021 (e.g. WFD conference minutes in Liège, Belgium, November 2010).

In regard to this situation the present report aims to provide an objective overview of the CEA implementation in EU countries and help to design and improve the application of CEA in France in the second WFD cycle, taking into account the experiences of other member states. In order to achieve this, a four phase approach has been chosen:

Phase One of the research project (General Screening of CEA Implementation in Europe) has contacted over 200 experts in 22 European countries in order to collect studies that display a CEA in the WFD context. Furthermore, first general questions on the state of CEA in the respective countries have been posed. Besides contacting the experts a literature review and internet research has identified further documents that indicate the state of CEA.

This eventually led to the creation of a database with 88 studies undertaken in the context of WFD and 55 additional background documents.

Phase Two of the research project (Assessing the application of the cost-effectiveness analysis through detailed study analyses) has taken a closer look at CEA studies which were selected for a more detailed analysis. Therefore, out of the 88 CEA documents found in regard to the WFD (Phase 1), 48 have been further scrutinised in regard to measures, sectors and themes, general methodology, cost, effectiveness, process transparency, stakeholder participation, technical limits and decision making. The information extracted was collected in individual “case study overviews” (*“fiches de lecture”*).

Based on this information Phase Two of the report gives a picture of the state of the methodologies used in the CEA. The results of Phase Two already provide some clear indications on the subject, yet they lack information on two important points:

- The results do not deal with the reasons for the little amount of CEA found.
- The results only partly refer to institutional, procedural and governance aspects of the CEA application.

Therefore, further information was gained from in-depth interviews with country experts in Phase Three in order to get a comprehensive understanding.

Phase Three of the research (Expert Interviews on Methodology, Institutional Preconditions and Integration of CEA in the Decision-Making Process) has specifically addressed the context in which CEA was applied (governance, institutional) as well as the impact it has upon decision-making. This approach took a step back from the detailed analysis of the documents displaying a CEA to look at the reasons behind why these analyses were conducted and why more CEA were not conducted (or not published). By this enlargement of the research scope a clearer overall picture can be derived in which we learn not only what has been done and how but also what has not been done and why.

Phase Four, finally, synthesises the previous steps and sums them up in this research report. In order to reach not only the client ONEMA, but all experts and decision makers interested, two versions of this report will be compiled, in French and in English.

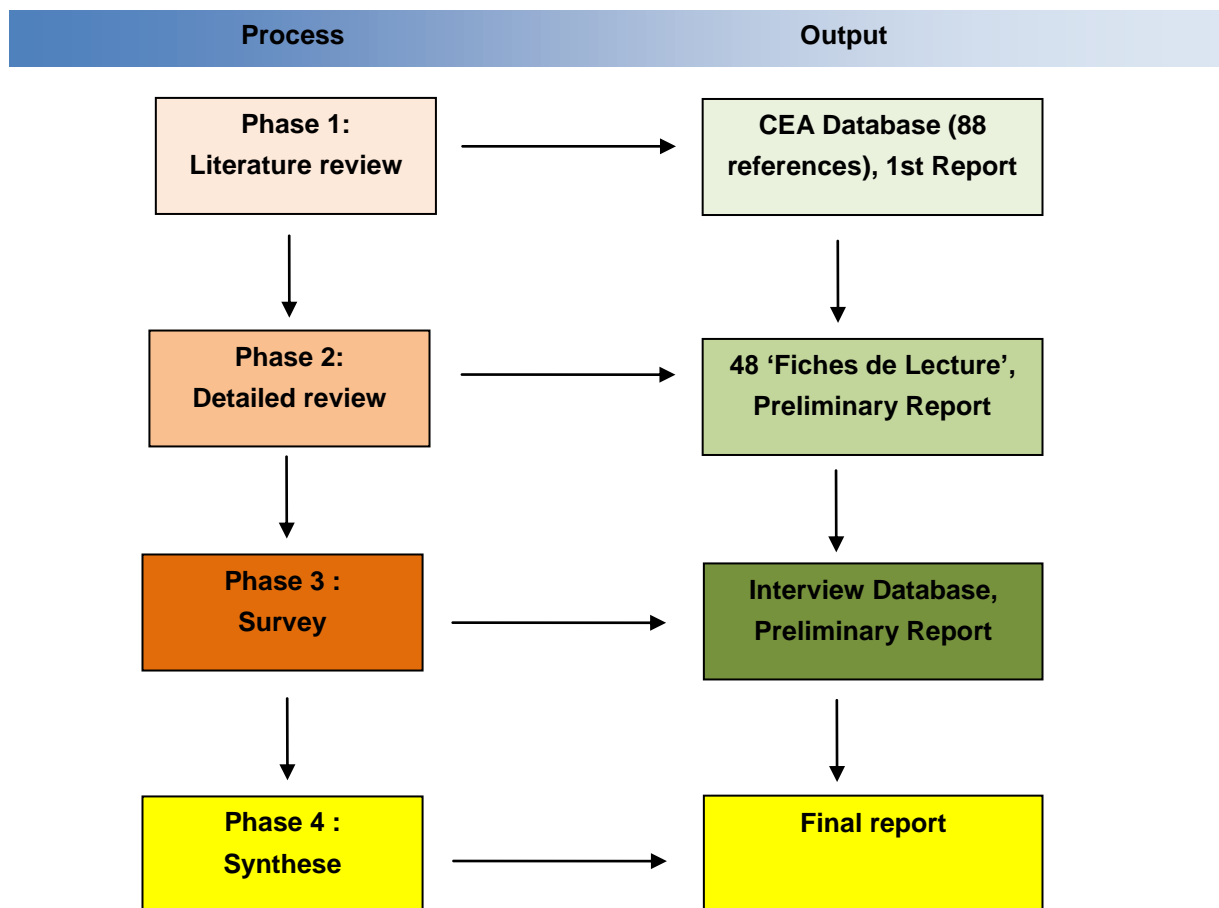


Figure 1. Figure summarising the research process, including the output of each phase

2 GENERAL SCREENING OF CEA IMPLEMENTATION IN EUROPE

2.1 Screening methodology and development of a CEA database

In the first phase a large number of country experts were contacted to enable access to documents where a CEA was conducted and to provide first insights into the situation of the CEA. The coordinates of over 200 experts from 22 countries were collected in a database and contacted in order to get a thorough and representative data-basis. The main point of interest was to find out:

- If a CEA under the WFD has been applied in the country
- The references and links of all these documents in English and in native languages
- Contact details for other experts/authors of CEA

The experts were not only asked to send (links to) documents that include a CEA but also to briefly give their opinions regarding the use of CEA in their respective country.

In addition, an internet and literature research was launched to get further material like guidelines, background documents, or CEA from other countries and fields. All in all, 55 documents in addition to the documents provided by the experts were found.

Both, the expert opinion as well as the background information from additional literature, was used to create a country overview table in which information on the state of CEA-use were summarised and constantly edited.

The screening provided a first overview and sufficient material (documents) for a first analysis of the CEA studies. All in all, 88 studies have been found that display a CEA in one way or another. This information was compiled in a database addressing the geographical coverage, references of the publication, sectors/water uses, type of water body considered, themes/environmental issues, process indicators and first feelings/further comments (see Figure 2 for details). In the last column the significance for further in-depth-review was assessed. In that way the quality of the CEA documents were evaluated and the relevant studies were filtered out. The reason for this was that there were some very short studies that could be considered insufficient as they didn't give any indication on the methodology.

Geographical coverage	Country	
	Geographical area covered by the CEA	
References	Publication - Name	
	Authors	
	Year of Publication	
	Publisher or Contracting body	
	Internet Link	
	Organisations associated with the Authors	
	Type of Publication	
	Relation to Water Framework Directive	
	Key focus	
	Contact	
Sectors	Agriculture	
	Industry	
	Household	
	Energy	
	Other (Please indicate)	
Type of water body considered	Surface	
	Groundwater	
Themes	Water quantity	Scarcity
		Excess
	Water quality	Status
		Load
	Hydromorphological issues	
Process indicators	Has a C/E ratio been calculated? (Y/N)	
	Have the measures been ranked based on Cost/effectiveness Ratio and/or experts judgement? (CER/EJ)	
	Are the different steps of the analysis developed in a transparent way? (Y/N/comments...)	
	First feelings/feedbacks of the assessors/experts	
	Relevant for a more detailed analysis in step 2? (Y/N)	
	Further comments	

Figure 2. Details of the CEA database

2.2 Results of the screening

The results of the first screening revealed that there were about 60 studies conducting a CEA. This number increased in the course of the research to 88¹. The countries with the initial highest share were Germany, UK, France, Netherlands, Spain and Slovenia. Soon it became clear that the number of CEA found was no direct indicator of the prevalence of CEA application in a country (see 3.1.1.). The studies were largely produced by consultants, scientists and government agencies. The types of publications that included CEA were case studies, background papers, evaluation reports of agencies, guidelines, academic research

¹ The overwhelming numbers of these studies are in relation to the WFD, few non-WFD studies have been included to help explain the countries methodology. Despite the research efforts the number of CEA found cannot claim to be completely exhaustive. This study however offers a good picture of the situation and is the broadest comparative research on the topic to date (Jan 2011).

papers, pilot project reports and river basin management plans although the latter were not the majority of documents².

In the studies, the sectors mainly addressed were agriculture, followed by industry and households. The main theme was water quality with only some studies dealing with water quantity (excess/scarcity) and hydromorphology. Surface water was the preferred type of water body considered. Detailed results can be found in the section 3.2 with the analysis of the selected documents from phase two.

More than half of the studies (55% of all studies found, 48 in numbers) were considered transparent and useful for further analysis.

² RBMP (16%), Guidelines (13%), Background (19%), Academic research (23%), Project reports (23%), overlaps.

3 ASSESSING THE APPLICATION OF THE COST-EFFECTIVENESS ANALYSIS THROUGH DETAILED STUDY ANALYSES

3.1 Methodology of literature review:

3.1.1 CEA studies identified and selection for further detailed analysis

Figure 3 shows the distribution of the selected CEA studies among the countries investigated. However, it should be clear that the amount of CEA per country only partially indicates the prevalence. Some countries, like the Netherlands and the United Kingdom, have established quite an extensive research and data basis where a generic approach offers data with an embedded CEA (costs and effectiveness are already assessed), therefore limiting the number of CEA conducted. In discussions with experts it became also clear that often CEA are conducted behind closed doors and without publishing the procedure (grey literature). As an example, we can frequently find in the UK River Basin Management Plans the phrase “The findings of the preliminary CEA meant that very little additional work on cost effectiveness was needed at a more local level”. It should also be noted that only about 1/6 of the documents found are part of a RBMP while the other documents are case studies or research papers (many of them might have been used to prepare the RBMP). Despite using a number of multilingual experts from various countries a few CEA studies could not be evaluated due to language restrictions, like e.g. the Lithuanian CEA studies that were only in the national language.

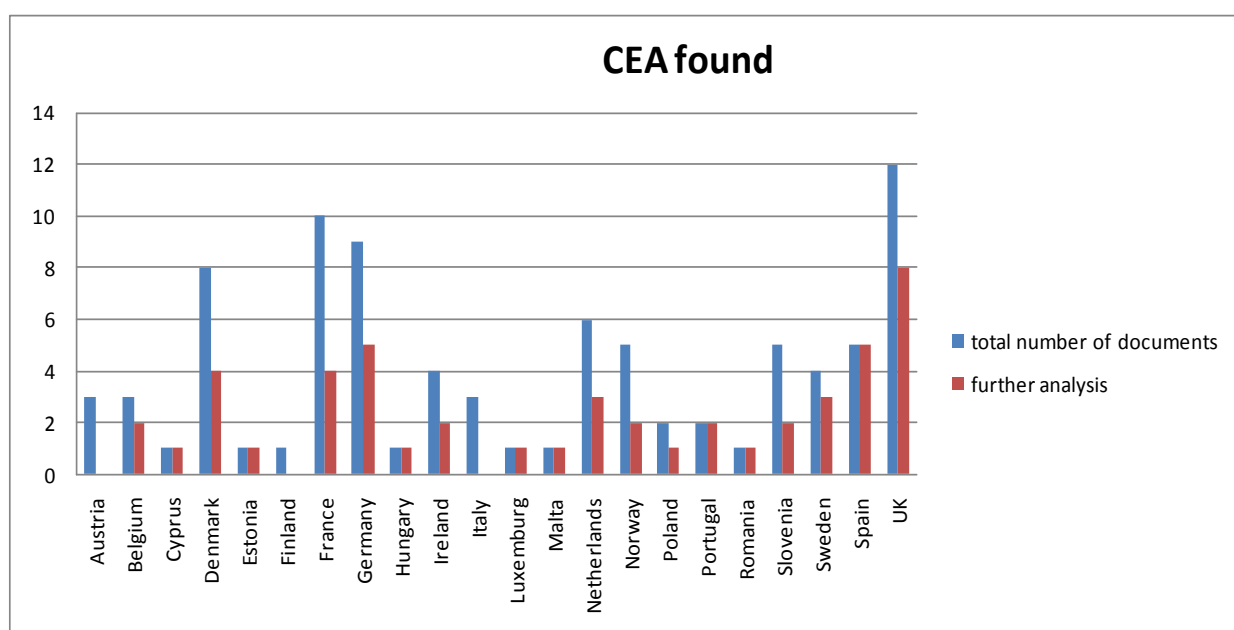


Figure 3. Overview of number of CEA studies found and further analysed per country

3.1.2 Development of review templates ("fiches de lecture"):

The 48 chosen studies were re-read and analysed according to 5 main categories: Measures, General Methodology, Costs, Effectiveness and Process. The respective results were filled in a review template ('fiche de lecture').

Name Ribble Pilot Trial Report		Country: UK	
Author/Organism : Stout, Lisa and Fenn, Teresa, RPA,	Date 2005	Geographical Area covered: Ribble	
Links : http://www.wfdcrp.co.uk/pdf%5Cp2a-2b-annex1.pdf		Themes (See Data base): Water quality Status, <u>Hydromorphological</u> Issues	
Key Focus (See Data base): Pilot Study on CEA use		Sector (See Data base): Agriculture Industry	
Which environmental policy? <input checked="" type="checkbox"/> WFD <input type="checkbox"/> Nitrate directive <input type="checkbox"/> Other:			

Measures	
Does the CEA analyze measures or combinations of measures? combinations	
How many measures are compared in the CEA? 27 measures, two measure parcels with 8 measures each	List of measure compared (if <5) / Type of measures (if > 5): Phosphorus, morphological pressures, urban runoff, combined sewer overflows, runoff agriculture
What are the main differences between measures? pollutants measures and morphological measures, combined in parcels	

Methodology																																																																																																																	
C/E Ratio calculated? No	Illustration of C/E ranking from the study: <table border="1"> <thead> <tr> <th>Costs</th> <th>Effectiveness</th> <th>Ratio</th> <th>Rank</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>5</td> <td>5</td> <td>5</td> <td>5</td> </tr> <tr> <td>6</td> <td>6</td> <td>6</td> <td>6</td> </tr> <tr> <td>7</td> <td>7</td> <td>7</td> <td>7</td> </tr> <tr> <td>8</td> <td>8</td> <td>8</td> <td>8</td> </tr> <tr> <td>9</td> <td>9</td> <td>9</td> <td>9</td> </tr> <tr> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>11</td> <td>11</td> <td>11</td> <td>11</td> </tr> <tr> <td>12</td> <td>12</td> <td>12</td> <td>12</td> </tr> <tr> <td>13</td> <td>13</td> <td>13</td> <td>13</td> </tr> <tr> <td>14</td> <td>14</td> <td>14</td> <td>14</td> </tr> <tr> <td>15</td> <td>15</td> <td>15</td> <td>15</td> </tr> <tr> <td>16</td> <td>16</td> <td>16</td> <td>16</td> </tr> <tr> <td>17</td> <td>17</td> <td>17</td> <td>17</td> </tr> <tr> <td>18</td> <td>18</td> <td>18</td> <td>18</td> </tr> <tr> <td>19</td> <td>19</td> <td>19</td> <td>19</td> </tr> <tr> <td>20</td> <td>20</td> <td>20</td> <td>20</td> </tr> <tr> <td>21</td> <td>21</td> <td>21</td> <td>21</td> </tr> <tr> <td>22</td> <td>22</td> <td>22</td> <td>22</td> </tr> <tr> <td>23</td> <td>23</td> <td>23</td> <td>23</td> </tr> <tr> <td>24</td> <td>24</td> <td>24</td> <td>24</td> </tr> <tr> <td>25</td> <td>25</td> <td>25</td> <td>25</td> </tr> <tr> <td>26</td> <td>26</td> <td>26</td> <td>26</td> </tr> <tr> <td>27</td> <td>27</td> <td>27</td> <td>27</td> </tr> </tbody> </table>	Costs	Effectiveness	Ratio	Rank	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27
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On which parameters ? Example of C/E indicator: Costs/effectiveness as a range (% Gap addressed, % geog addressed) Measures ranked based on C/E ratio and/or Expert judgment Pairwise <u>comparisons</u>																																																																																																																	

Which costs of the measures have been taken into account? Present Value Costs and Equivalent Annual Value				
Investment cost (Please describe): Yes, but not described	Operation and maintenance (Please describe): Yes, but not described	Indirect costs (Income losses...) (Please describe): Listed non monetary (job loss etc)	Environmental costs (Please describe): Yes, but not in monetary values	Others(transaction costs...) (Please describe): Yes, but not in monetary values
Method for <u>annualizing</u> : Equivalent Annual Value				
Are the cost distributed among <u>financers</u> ? Not mentioned				

How has effectiveness been taken into account? % Gap addressed, % geographic scale, time for measure to be effective, certainty of outcome and <u>non-monetised</u> costs			
<input type="checkbox"/> Global in terms of general impact on the water body status:			Examples of indicators of effectiveness used: % of Gap addressed
<input checked="" type="checkbox"/> limited to one (few) parameters of the water status : P, habitat diversity etc.			
Tool used to measure effectiveness?			
<input checked="" type="checkbox"/> Expert judgment (Please specify): Environment Agency Local Staff, UKTAG	<input type="checkbox"/> Models (Please specify):	<input checked="" type="checkbox"/> Field experiment (Please specify): Testing	<input checked="" type="checkbox"/> Others (Please specify): UKTAG information
Are uncertainties quantified? (Please specify): reliability and accuracy and confidence bands for each measure were identified			
Process			
Who built the CEA? Effectiveness Methodology by UK Collaborative Research Programme		Which role of stakeholder consultation? Theoretically yes, this testing of the methodology did not have time to	
Are the different steps of the analysis developed in a transparent way? Yes			
Are there iterations in the implementation process? No, because of time constraints			
Which integration of the results in the decision making process? Not clear			
Limit of the analysis: probably not very precise			
Main constraints encountered: Lack of data and time. Assumptions had to be made to assess costs and effectiveness, particularly for morphological measures.			
General comments: Time and Data constraints were brought up. A transparent CEA needs time and the involvement of the stakeholders.			

Figure 4. Example of review template ('fiche de lecture')

The full list of studies can be found in Annex 1.

The fiches de lectures are provided in Annex 5.

3.2 Results analysis Phase two: methodological choices to implement a CEA

3.2.1 Sectors/water users and Themes/environmental issues

From the 48 studies analysed, almost 2/3 of the CEA addressed the agricultural sector which is not surprising, as mitigating diffuse pollution from agriculture (especially Phosphate and Nitrate) is recognised as a major objective in the WFD process. Furthermore, in some countries, e.g. Germany and Austria, approaches similar to the CEA under the WFD (“Variantenuntersuchung”/investigation of alternatives) are part of the normal planning process for urban water management. Industry and households were also often addressed, with approximately half of the studies dealing with each sector. (see figure 5).

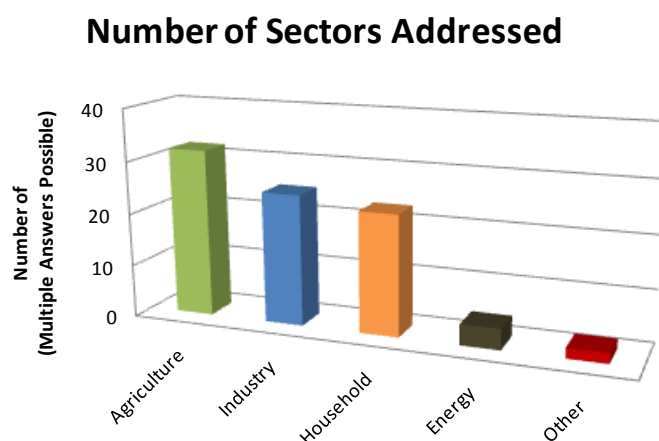


Figure 5. Number of sectors addressed in the CEA

The CEA mainly focussed on surface water, with fewer of the cases including groundwater (see figure 6). Some CEA are addressing both.

Type of water body addressed

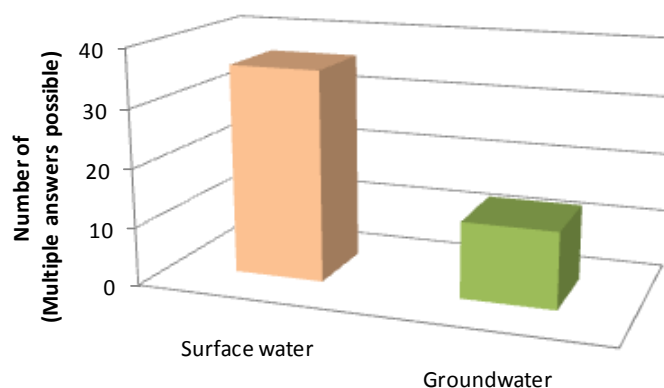


Figure 6. Type of water body addressed

Water quality issues (water pollution) are by far the most addressed environmental issues in the 48 studies investigated (see figure 7). Different reasons might explain that. As compared to hydromorphological or ecological issues, it is agreed by most experts that the effectiveness of water quality measures (e.g. pollutant reduction expressed in P load) is easier to determine than the effectiveness of “ecological” measures (e.g. dealing directly with hydromorphology, fish population). Another probable reason is that ecological issues are relatively new in the water management decision whereas, water quality issues were already investigated by researchers and decision makers before the WFD. The reasons why quantitative issues are less addressed are believed to be different. Indeed, the countries where these issues are important (mostly the southern countries) happen to be the countries where fewer CEA studies were carried out.

In regard to water quality issues, the focus is usually on particular pollutant loads, although many studies analyse the efforts to an overall ‘good’ status³ and some studies do both. Some studies conducted separate CEA for both water quality and water quantity issues (example Malta). The scale of the CEA was highlighted in some studies as relevant and problematic in regard to estimating the data. Local analysis often did differ considerably to values from global analysis (e.g. effectiveness of measures) because of site-specific peculiarities.

³ This is the case in France, where the costs of different combination of measures achieving the good water status were compared

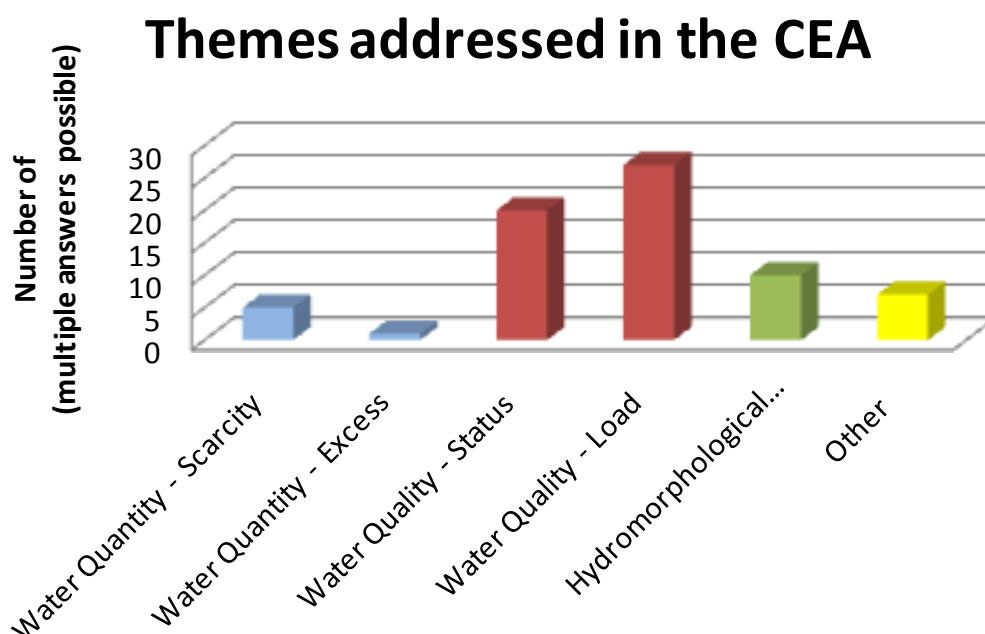


Figure 7. Environmental themes addressed

3.2.2 Measures

Regarding the measures compared in the CEA, it can be stated that usually there are slightly less approaches that address individual measures as there are approaches addressing combinations of measures. Sometimes, measures are pre-selected individually and then grouped in measure packages. In average, the number of individual measures compared is around 20 while the number of measure packages naturally is significantly lower (average around 5). In general, the measures can be distinguished in addressing the following issues:

- Technical pollutant reduction measures
- Pollutant reduction measures addressing land use (arable to grass conversion, buffer strips)
- Pollutant reduction measures addressing wastewater (upgrading wastewater treatment plants)
- Pollutant reduction measures addressing agricultural practices (fertiliser restriction)
- Measures to restore hydromorphology
- Sectoral measures (agriculture)
- Measures addressing a particular geographic scale (local, national)
- Administrative measures (rare)

3.2.3 Cost Effectiveness Ratio

In the 48 CEA cases reviewed there were about 75% of approaches calculating a Cost-Effectiveness-Ratio (CER) while about 25% of the documents did not produce a CER. A very common CER is cost per pollutant reduction per litre (status parameter) or cost per reduced kilogram of pollutant (pressure parameter).

One explanation for the lack of full CER coverage in the case studies is that a qualitative approach has difficulties to come up with exact measurements for effectiveness and thus cannot calculate a CER. Even in countries with good data access this might be the case. Expert judgement is still a popular alternative. Correspondingly, only 2/3 of the documents rank the measures on the basis of a CEA. Some examples of ranking measures without calculating a CER *per se* were also found. In those cases, a qualitative appreciation of the effectiveness allowed to rank the measures⁴, e.g. the effectiveness of the measures selected by experts was assumed equal to 1 (100% efficiency with respect to the WFD objective). Hence, measures are ranked according to the cost of measures.

Finally, some case studies use optimization procedures in which there is no explicit ranking based on CER, but simulation models are applied to find least cost combination of measures to meet the standards (e.g. Jucar basin, Spain).

3.2.4 Cost and Effectiveness

Regarding the cost assessment, 75% out of the 46 cases mention investment costs, followed by operation and maintenance costs (about 60% of the cases mentioned them). The 25% of other cases do not give details but most certainly also consider these two types of costs. Indirect costs and environmental costs are much less mentioned as part of the CEA. About 30% of the cases included indirect costs, classified e.g. as forgone value, opportunity costs or income losses, often as part of a qualitative approach. About 20% of the 48 cases include environmental costs. Finally, 15% include other costs, which included administrative costs, record, storage and transport costs as well as subsidies and non capital measures as cattle access restriction to certain agricultural areas⁵. It is important to keep in mind that multiple answers were most common. An overview is found in figure 8.

⁴ See for example BRGM (2007), Evaluation économique du programme de mesures de la Directive cadre sur l'eau sur le secteur Seine Aval du bassin Seine Normandie - Volume 1 : Méthodologie et chiffrage du coût du programme de mesures

⁵ Because of the mix up of CEA and Cost Benefit Analysis some of the environmental costs and other costs are not appropriate for the CEA (like contingent valuation) but nonetheless included in the count

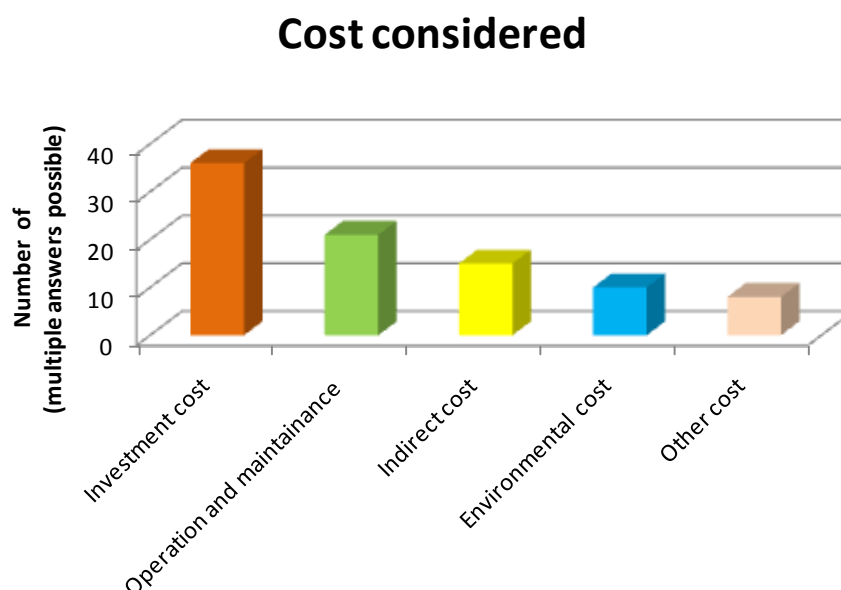


Figure 8. Cost considered

About 70%⁶ of the cases specify that the discounting of costs was undertaken, usually with 3 to 5% discount rate.

The issue of cost distribution among potential actors was neglected in the documents reviewed. Almost 70% did not mention this. Of course, it has to be considered that a certain part of the CEA reviewed has a scientific (technical) background that doesn't consider cost distribution but works on methodological insights. Moreover, in some RBMP development, cost distribution issues have been tackled in separate reports than the CEA carried for selecting the measures. These complementary reports have not been reviewed in this study focussing on CEA.

In many reports it was pointed out that it is difficult to assess effectiveness of a measure or a group of measures. This might be one reason why there are more CEA that are limited to one or more indicators of effectiveness (70%) rather than global in terms of general impact on the water body (30%).

In order to estimate effectiveness, expert judgement and, to a lesser extent, models and generic data are used. Field experiments and other ways of estimating effectiveness are rare (see figure 9).

⁶ As for the other statistics, this does not mean that the other studies (30%) did not indeed discount the costs

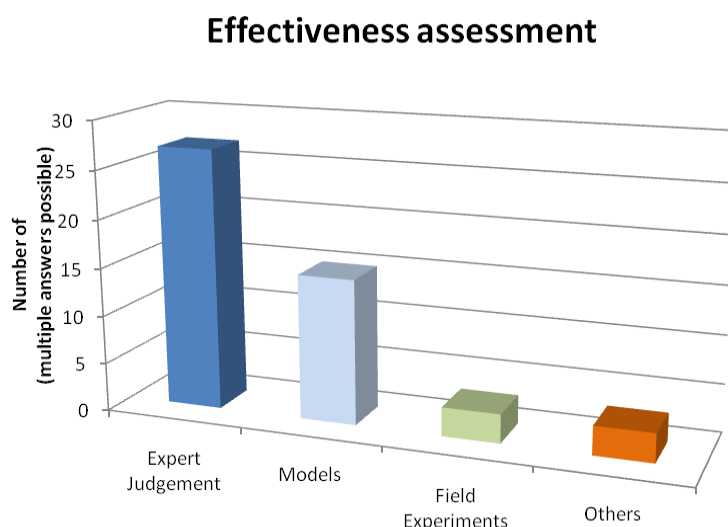


Figure 9. Effectiveness assessed

As mentioned before, uncertainty of data is a major constraint in CEA. Assessing this uncertainty requires deep analysis and expertise on the assessment of effectiveness or cost elements. It could explain the fact that only 40% of the cases used methods to deal with uncertainty (e.g. sensitivity analyses).

About a quarter of studies have the CEA methodology built and designed for a specific case study. In many cases a generic procedure was followed that was established by national government bodies (about 30%) or consultancies and universities, sometimes in cooperation.

3.3 Technical limits

The collection and analysis of technical limits is one of the crucial aspects of the CEA-research as it enables to give a broader picture of the application of the CEA in regard to the WFD. Some of it already crystallised in the previous paragraphs but here the main motives are collected and summarised.

- Uncertainty of costs and especially factors affecting assessment of effectiveness is seen as the major limitation, as mentioned by the assessors in more than 30% of the cases.
- Limited information/lack of data on cost and effectiveness takes up the second place
- Geographical scale (too large scale) and time horizon constraints are also mentioned.
- Furthermore, the assessors also find fault with the missing of sensitivity analysis, the brevity of the analysis, the mechanical, technical approach to CEA ignoring social

impacts as well as the lack of behavioural elements. The shortcomings of the generic data are also addressed.

Little information was extracted from the documents in terms of operational constraints of the CEA process, but they include the lack of time, the hindering political context (Selection of measures is not based on CEA but on political bargaining) and the high work intensity of the CEA.

3.4 Results analysis: implementation process

3.4.1 Generic vs. specific approaches and data

The research also scrutinised if the CEA was conducted using a generic approach which helps the (local) decision maker by providing data that has undergone cost and effectiveness analysis at national (regional) level. This is the case in more than a third of the cases analysed, although not all cases exclusively rely on generic data. In databanks and research projects such as the Dutch “Knowledge System Measure”, the English “Preliminary Cost Effectiveness Analysis” or the Irish “Eastern River Basin District project decision support system” the CEA is already conducted in long lists of measures for various situations (e.g. measure list for Dutch greenhouse tomato farming that has to reduce nitrate emissions). In some cases, a framework with generic rules is defined for the CEA at the national scale, to be applicable for all the local River Basin Districts (e.g., the Spanish Ministry of Environment, which also provided some Guidelines and Recommendations for estimating the cost of measures). It is also common that other countries data bases are used for establishing costs and effectiveness in countries that lack the data resources (like German and Austrian data used for Slovenian Twinning projects and the database in Luxembourg also including data from Austria and Germany). This however bears the danger that measurements are not accurate as already in countries

The **Knowledge Measure System (KMS)** was a Dutch platform to exchange information and share experiences related to cost effective measures in the WFD context. The idea was to create a publicly accessible internet tool which comprises of sufficient information for local decision makers to choose cost effective measures but also to add information on measures. KMS enabled to search or choose measures, get information on impact (with steering variables), costs and extra information. Because of limited input from the regional water boards, it was decided to improve the approach and make it more user-friendly.

Currently, a new WFD-Explorer is being developed for 2012. The WFD-Explorer will be the analysing-tool and decision support instrument for the second river basin management plans (2015 – 2021) to calculate the effects of generic policy and to support the development of regional measures.

Figure 10. The Dutch Knowledge Measure System

like the UK there are complaints that generic data do not fit in certain locations. Also, it became clear in some case studies that good data might be the base for a sound CEA, yet that other factors (locality) have to be sufficiently considered to give a good picture and avoid a purely mechanical approach. The continuous improvement of generic data has been advised in some reports. One Swedish expert stresses that one important future issue in Sweden is the development of a common library of measures or database that may be used to “gather, quality assure, communicate and analyse measures with regards to effect, costs and administrative feasibility”.

3.4.2 Stakeholder Participation

Stakeholder consultation is predominantly not mentioned, in 2/3 of the studies. Participation options for stakeholders in regard to the CEA or the CEA results are mentioned in about 30% of the cases, like consultation for definition or validation of measures, discussion of the results and providing other input. Nonetheless this result confirms the previous stated impression that the CEA reviewed are often conducted in a technical (one author used the term mechanical) way, with little information on implementation and decision making context. In most of the countries, consultation was part on a specific process once the draft RBMP was written. So in many cases the final datasets have been discussed in this process.⁷

3.4.3 Transparency and iterations

Most CEA were described as transparent, although sometimes too short. Lack of transparency was assessed in about 30% of the cases reviewed. This refers to the transparency of the studies analysed, which often were case studies to exemplify guidelines or methodologies.

⁷ From previous assessments we know that participation was a central element in developing the overall list of measures before the CEA and in the selection.

It should not be confused with the issue of transparency of CEA in accessibility (the fact that only relatively few CEA could be found).

Iterations in the selection of measures were only conducted in 20% of the CEA, while the remaining 80% are not addressing the issue in their analysis.

In the German Federal State of Lower Saxony an **iterative participatory mechanism** has been installed to facilitate the selection of measures. This process includes the state government as well as regional cooperations/associations ("Gebietskooperationen"), which comprise regional authorities, local government agencies, environmental organisations, water suppliers and other stakeholders involved. The practical application of the CEA has proven to be relevant yet it has revealed its limitations, especially regarding the complexity of ecosystems and the practical feasibility of measures. Thus, measure selection is undertaken in an iterative negotiation process combining "top" expertise and "bottom" know-how of local context. The process includes a CEA which is conducted based on the German standardised catalogue of measures and adapted to the local conditions (see Figure 10). The final results are then delivered to the state. The measure proposal also includes institutions or persons responsible for implementation (ownership principle). Finally, criteria have to be met like voluntariness, financial and juridical viability as well as availability of land.

level	Identification of measures/ Single measures	Regional cooperations	Administrative institutions
Reference to measures	Problem analysis and compilation of potential measures	Coordination and first selection of measures	Statewide selection and prioritization of measures
Potential mechanisms to ensure and support cost effectiveness	On-site and expert knowledge, feasibility studies, cost estimations	On-site and expert knowledge	Expert knowledge, prioritization schemes and guidance documents
Methodological approach for investigation	Cost-effectiveness-analysis	Descriptive evaluation of institutions and expert interviews	Descriptive evaluation of institutions and expert interviews

Figure 11. Three levels of verification of cost effectiveness in Lower Saxony (Niedersächsisches Ministerium für Umwelt und Klimaschutz, 2010)

3.4.4 Decision making

As already mentioned before, less than 40% of the studies mention integration of the results into decision making (including studies that only briefly and partly address the topic) while mostly it is not mentioned or described as problematic. Again, we can refer to the fact that many studies are not part of a RBMP. For many studies this issue was probably not considered.

3.5 Conclusion of Phase Two

Looking at the results of the second step in-depth analysis of the CEA we can state that relatively few thorough cost effectiveness analyses could be found compared to the number of River Basin Management Plans. By taking a closer look some reasons for that become evident:

- CEA for water-related issues might be difficult and sound data is often complex to get or to estimate. Uncertainty or lack of data is the main problem.
- Furthermore, the geographic scale (water body to sub-basin and districts) can pose hindrances.
- It also seems that there are CEA undertaken but not published or accessible in any other way which brings up the issue of transparency.
- Many countries in South or Eastern Europe lack the data and the expertise required to conduct a meaningful CEA. Twinning projects try to help in building capacities.

Apart from reasons for the low number of CEA, the research of phase two can also provide us with information on the quality of the CEA conducted.

- The research has found many interesting studies, which are the result of thorough work, considering details like upstream issues, uncertainty, social, economic and the environmental scale and context.
- There were also some studies found using questionable methods (mix up of CEA and CBA or other forms of improper CEA) and imprecise data (especially in countries with less experience in economic instruments and less research - and funding). Financing, participation and applicability for further use in decision making are aspects that were often missing.

4 EXPERT INTERVIEWS ON METHODOLOGY, INSTITUTIONAL PRECONDITIONS AND INTEGRATION OF CEA IN THE DECISION MAKING PROCESS.

In the results of Phase Two, issues like **data uncertainty**, **generic data**, **transparency**, **scale** and **governance** were indicated as important aspects that determine the relevance of CEA, the accessibility as well as the ability to conduct them. The interviews conducted in Phase 3 further addressed these aspects and found out more on the methodological, institutional and decision-making side of CEA.

4.1 Methodology: expert interviews

In step three, 22 country experts were contacted and interviewed for about 30 minutes each (see Interview Table in Annex 2). The persons interviewed were researchers and professors from universities, consultants, government (agency) officials at national or regional level and NGO representatives. In some countries, where very little activity regarding CEA has been observed in phase 2 (like Bulgaria, Italy, Greece), no further interviews were conducted as all available information was already collected. The interviewers used a questionnaire (Annex 3) that was partitioned in 3 parts:

- A methodological part researching the context and specifications of the methodology applied
- An institutional part inquiring about cultural and institutional preconditions, restrictions and openness towards CEA
- A decision-making part, asking about the relevance and hindrances of CEA to be involved in the decision-making process

4.2 Results analysis

The results achieved in phase 3 underlined the first assumptions made in phase 2 and gave new insights into the broader context of the use of the CEA. In the following the results are listed according to the tripartition of the questionnaire in methodological, institutional and decision related sections. They summarise the most important and most frequently mentioned statements from the interviews of the EU countries. The situation in France is outlined extra because of the significance for the client ONEMA. There exists a considerable heterogeneity between countries, usually between North Western EU member states and new Eastern member states as well as Southern European states. Furthermore there is a distinction between countries that are classically more liberal and open for economic instruments and others that have a political culture that traditionally doesn't favour the use of

economic tools to a great degree. A country overview of CEA application can be found in Annex 4 for further information.

4.2.1 Methodological choices

4.2.1.1 Motivation for the use of CEA

The first question asked for the main motivation for the use of the CEA. Here some countries (Slovenia, Cyprus, Luxemburg, Hungary, Slovakia, Romania, Lower Saxony/Germany) state that the WFD obligations were the driving force behind the CEA application while for other countries (UK, Netherlands, Denmark, Norway) effectiveness and efficiency evaluation is a part of their general political culture. In these kinds of countries CEA has for the last number of years been an integrated part of policy evaluation. Often these initiatives have the treasury as driving force (like in UK, Denmark). In other countries CEA has been part of the choice selection for certain planning processes (for urban water management in Germany and Austria, for the comparison of different infrastructure measures in Spain).

4.2.1.2 Form of CEA application

When asked, how the CEA has been applied in the WFD process in the respective countries we get a spectrum of answers:

- In the UK, a preliminary CEA with online generic databanks/measure selection tools has been implemented so that only cost effective measures would be selected. This systemic 'top-down' approach received some critique from NGOs so that now there are efforts in the UK to shift the focus more locally.
- The Dutch strategy seeks to institutionalise CEA into the WFD process by creating procedures, methods and guidelines where the selection of measures happens on the basis of reciprocity between action and analysis on national and regional level. The central government is responsible for an effective regulatory framework and identified the main overall measures through a strategic social cost-benefit analysis. Most measures regarding regional surface water systems and shallow groundwater are selected by the democratically elected water boards. Thus, we have a variety of approaches to CEA in the Netherlands depending on the water board. In the Netherlands there is also a generic data approach.
- There is also no single uniform approach in Spain, where the Ministry of Environment has provided some basic guidelines on how to conduct the CEA study and a database with information to estimate the costs of different measures. From that common framework, each Spanish RBD has chosen their own approach depending on data, time, knowledge, models available, decision process, etc.

- In Germany the federal approach gives each state the right to determine the CEA approach for its river basin. The association of the ministries of the German states responsible for water management and water legislation (LAWA) has however tried to harmonise the water management activities and has publishes a more general guideline/catalogue. This, together with some case studies has been the basis for the action of the states.
- In Sweden too, the limited extent of CEA implementation varies both between the five RBD and between the kinds of water problem.
- A systemic use of the CEA on the water body level was found in Luxemburg.
- Denmark has (like e.g. the Netherlands) chosen to express the gap to the environmental target in terms of tonnes of N or P with respect to the targets in the Fjords and the lakes. This has made is possible to conduct a more simple CEA analysis as there has been one effect parameter. For the rivers the focus has been on physical conditions. The process in Denmark has been to present a national list of measures, choose the best and analyze them in more detail. Side-effects (CO₂) have been taken into consideration. Also, whether the measures can be controlled is an important factor in the final Danish CEA analysis.
- In Norway, the economic analyses of measures undertaken so far is not considered sufficient enough to guide cost-effective decisions to manage water resources in order to comply with the WFD requirements. There is a need for clarity, further guidelines and standards for conducting CEA studies.

In the Euopean Socopse project (Source Control of Priority Substances in Europe) a **Multi Criteria Analysis** has been used to assess the ranking of various abatement measures, according to cost effectiveness and a number of other criteria (importance, availability, scale and scope). Based on the WFD requirement to select the most cost efficient measures the multi-criteria tool **ELECTRE** is applied for the ranking process. This ranking feeds into the building of an emission reduction strategy but is also offered as a support for the implementation of the second phase of the WFD. Weights are allocated by expert judgement. This multi criteria analysis is built in a cost/efficiency analysis framework because the overall weights given to the environmental efficiency equal the weights given to the various aspects of costs. This model does not deal with social costs; this is advised to be done separately. It is also advised to undertake a sensitivity analysis.

Criterion j Action i	1/ Efficiency	2/ Cost	3/Importance	4/Availability	5/ Scale	6/ Scope
1/Activated carbon adsorption	$g_1(a_1)$	$g_2(a_1)$	$g_3(a_1)$			
2/Reverse Osmosis	$g_1(a_2)$					
... 250/Membrane filtration	$g_1(a_{250})$					
Criterion weight	1/3	1/6	1/6	1/6	1/12	1/12

Figure 12 ELECTRE Multi-Criteria Analysis model (Socopse, 2009)

CEA calculation was applied on pilot projects and case studies or specific cases (like only for hydromorphological measures in Slovakia) in many Eastern European countries. In Finland, data on impacts of measures hasn't been sufficient enough to do CEA to large extent. Instead, multi criteria decision analysis methods, based on expert judgement of effectiveness of measures, were developed and tried. A multi criteria approach was also partly used in (e.g.) Germany, Sweden and international research projects (see also figure 11).

4.2.1.3 Efforts on national level

The existence of guidelines and databases on national basis can be seen as beneficial for the application of the CEA, as it provides the agents at the relevant river basin levels with information and structure that might be time- and money intensive to acquire otherwise. However, elaborated guidance and databases on national level is no guarantee for a successful CEA application in a country, e.g. in Finland and in Sweden where the guidelines were not practical enough for regional planners. Moreover information of impacts of measures is lacking quite often which hinders implementation of CEA process. Guidelines have been set up in many countries (Germany, UK, Spain, Netherlands, Ireland, Hungary, Norway, Finland, Sweden) some of them as a result of twinning projects (Poland, Slovenia). Most of these countries have also established databases on measures including their costs and (sometimes) effectiveness, although to various degrees. The Netherlands and UK are in the forefront with large amount of collected data. In the UK, Defra led a whole Collaborative Research Programme which provided CEA guidance, methodology and tools. In Ireland, the database was constructed at River Basin level using an innovative interactive web system (like UK and Netherlands) where data can be added or adapted by the authorised stakeholders. In Spain, a technical guidance document ("Guía Técnica de Medidas") provides detailed information concerning the cost and effectiveness of standardised measures. This has been used by the river basin authorities in those cases where no specific information about measures was available. Information was also exchanged and borrowed from other member states, particularly in small countries.

4.2.1.4 Steps of the CEA implementation

The steps of the CEA are in their basic approach similar in many countries (perhaps as they follow the WATECO example).

- Step 1 Describe and Quantify Gaps;
- Step 2 Identify Potential Measures and Delivery Mechanism;
- Step 3 Consider Effectiveness of Measures and Delivery Mechanisms;
- Step 4 Consider Costs of Measures and Delivery Mechanisms;
- Step 5 Combine Measures;
- Step 6 Identify most Cost-effective Measure or Combination of Measures.

However, there are quite considerable differences that emerge when looking closely. These are mostly related to

- scale and level (construction of list of all relevant potential measures at national level, Denmark)
- data information (use of data transfer, Cyprus)
- sector (costs estimation for individual types of hydromorphological measures, Slovenia)
- detail (consider potential and related CEA aspects like up-downstream effects, Netherlands)
- governance (administrative feasibility, Sweden)
- economic approaches (A supportive CEA, CBA result should be necessary, UK).

The German federal state of Schleswig-Holstein compared the costs and the effects and if all measures per km are below a predetermined threshold value of 245.000 Euro/km, cost-effectiveness was seen as given.

4.2.1.5 Main constraints

In regard to the evaluation of the main constraints for the development of a proper CEA, the following aspects were mentioned in selected countries (see figure 12):

Research on the Use of the Cost Effectiveness Analysis in Regard to the Water Framework Directive

	Access/ availability data	Quantification of costs	Quantification of effectiveness	Uncertainty regarding the previous data	Scale	Time constraints	Human – skills constraints	Other constraints
UK	Yes	Delivery mechanism costs, environmental valuation difficult	Difficult because not always easy to transfer			Time/money constraints		
Sweden	Yes – few common sources for information on cost of measures	Yes – costs differ depending on local factors	Yes – effects differ largely depending on local factors	Yes – the statistical basis is often too narrow	Yes	time was a considerable constraint during the first cycle		Legislation
Norway	There is often a lack of data, both regarding costs and effectiveness	often difficult to give a precise quantification	There is difficult to quantify the effectiveness of a lot of measures	This is also used as a reason	This is also used as a reason	This is considered to be difficult to handle.	Lack of economic knowledge which make the accomplishment of the CEA difficult	
Denmark		area specific conditions difficult		relying on the experiences from previous plans	Important to be realistic about potential in area			
Germany (Schleswig Holstein)		only estimates were available	only estimates where available	manageable	not an issue as the CEA was conducted not on the measure level but on the water body sub-catchment level.	manageable	manageable	
Germany (Lower Saxony)		partly difficult	ex ante evaluation of measures. In particular predicting the effectiveness				some knowledge had to be organised by consultants	
Slovenia	Yes		Only assessment of hydromorphological measures	Average prices from recent experience	Lack of data on the river basin scale	Partially	Lack of environmental economists	
Spain	Variety of data	Difficult in some cases	Varying level of definition measures, difficulty assessing combined effect, Difficulty comparing measures influencing different parameters	Uncertainty in general is high	Ideally done at the river basin scale. But in many cases, this is not necessary and we can focus on the water bodies	Clearly one of the main constraints	RBMPs demand much human effort, reducing the possibilities of more detailed studies	For groundwater overexploitation or pollution, diffuse pollution CEA procedures are not so well developed.
Cyprus	No, thanks to data transfer	Unfamiliarity with estimates of env. & resource costs	great uncertainty	Huge	Not a big issue in Cyprus	Due to small island size, not a serious issue	. On the economics side none.	

	Access/ availability data	Quantification of costs	Quantification of effectiveness	Uncertainty regarding the previous data	Scale	Time constraints	Human – skills constraints	Other constraints
Nether-lands		There are discussions and projects around the improvement of cost estimations of WFD measures	Ecological knowledge is developed in different projects	Information was not objective (uniform) from the 27 regional water boards				Problem incorporating natural science with economic analysis
Czech Republic	There is no uniform database in the CR		was not done					Global financial economic crisis and the political system
France	Yes, for some environmental issues (e.g. Hydromorphology)	Yes, at some level, although a database of unitary cost was developed by some Water Agencies	Quoted by all the experts interviewed as one of the most important constraint		Yes, RBD level is too large. As a consequence, the analyses and selection of measures was carried out a sub-basin level		Some experts stated that the restructuration of the human skills ⁸ within the Water Agencies led to an increased difficulty to have experts capable of defining the effectiveness of measures	- Lack of alternative measures to deal with one pressure -Some measures have effects on various parameters

Figure 13. Hindrances for the development of a CEA

⁸ A restructuration of human skills was made in some Water Agencies; from experts specialised in one type pollution and dealing with the whole RBD to experts specialised in one sub-basin dealing with all pollutions.

4.2.1.6 Stakeholder involvement

Stakeholder involvement is considered an important aspect of the WFD, although in the CEA process the issue was mentioned only by some countries. In England & Wales, some stakeholders were part of the CRP steering group. In the Netherlands participation in general was very good but depending on the water board the process of CEA was sometimes not transparent. At national level the participation was better which also explains the lack of protest when the final WFD process was implemented. Spain has also seen an active participation process, through contributions to the information generated by the River Basin Authority, sectoral meetings and reception of allegations or claims to the documents by the stakeholders. In the German state of Schleswig-Holstein the stakeholders have been involved mainly in the collection of possible measures while the process in Lower Saxony was more elaborated (see figure 10 above). In Denmark, involvement from stakeholders in the CEA phases was limited although advisory systems have been somehow involved in the discussion about the choice of measures. In Norway, Finland and to some extent Sweden, the stakeholders were contributing to the CEA. In Latvia the results of the CEA were presented during the public consultation process in order to know whether they are acceptable for the stakeholders. Other countries information on participation has been vague or missing.

4.2.1.7 Level of CEA

The level of CEA application varied considerably in the EU countries.

In England & Wales the national scale was addressed through the preliminary CEA, the river basin level through impact assessments and the water body scale through Environment Agencies' existing processes. However, the whole process was criticised as too centralised while the local activities were described as sparse. Slovakia had a two step approach beginning with middle and larger watercourses (water catchment larger than 100km²), then looking at some smaller water bodies. In the Netherlands the regional water board were the main level of action, although the national level (Rijkswaterstaat) dealt with some international river basins. Small countries like Luxemburg, Latvia and Cyprus could work at water body level. In Latvia it was emphasised though, that the linkage of water bodies, the flow direction and the mutual interaction of measures were taken into account. In Spain, there were different approaches at different river basins. It was found that in many cases it is not necessary to work at the river basin scale, but rather to focus on the interconnected water bodies. For some of the basins water quality problems, the problems are located in specific areas and for a few main pressures that need to be addressed. In Denmark CEA was applied at national level in the first analysis and secondly in the regional analysis. In Norway, Finland and Sweden, the geographic scale of most of the CEA studies in relation to the RBMP is on the water district and river basin level. However, analysis is also made on

more local levels. The German state of Schleswig Holstein applied CEA at sub-catchment, Lower Saxony at water body level. The Austrian approach was at measure level.

Dworak and Pielen (2006) have developed a first methodology on dealing with the **problem of scale** in the “highly complex” CEA application. Bottom-up and top-down methods both have shortages in their application, thus this model tries to bridge the gaps between cost-effective (technical) measures at the local scale and cost-effective instruments at the river basin scale with a three step method. This methodology is still on a general level but can be used as a base for addressing the issue.

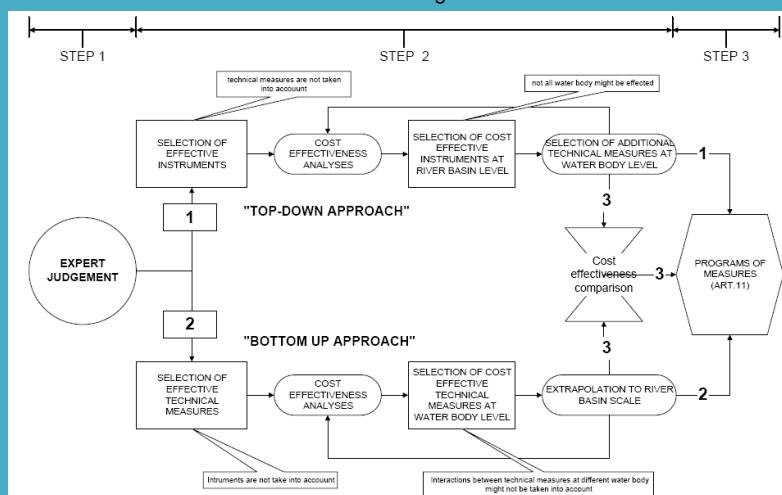


Figure 14. Methodology for a CEA linking top-down and bottom up approaches (Dworak, Pielen, 2006)

4.2.1.8 Link with other economic tools

The CEA is linked with other economic tools (mainly CBA) only in some countries. In the Netherlands at least three CBA have been undertaken (including ex post and ex ante evaluation), mainly “to support a proper underpinning for the PoM and the potential use of exemptions (phasing and/or lowering objectives)” (van der Veeren, 2008). In some river basins in Spain too, CBA was used to check for disproportionate costs. In the UK some elements assessed in CEA (water related impacts & non-water-related impacts) are used in CBA. Furthermore, CBA was used to show that time derogation is required and disproportionate costs exist. In Luxemburg the CEA is linked with a financing plan for the next years. In the German state of Lower Saxony the CEA is partly linked to the assessment (no quantification) of co-benefits.

4.2.1.9 Use of models

Some countries explicitly mention the use of models, but usually only for parts of the CEA process, e.g. to assess the most cost effective combination of measures to tackle phosphate or nitrogen (Denmark, Latvia) or for evaluation of the effects of proposed measures (Czech Republic, Spain). In England & Wales, a specific CEA tool was developed. In Finland, a model was used but due to the limited data, especially on effectiveness, its use was seen as limited. In general the use of models needs to be improved. In a 2007 study Interwies (p.7)

has similar results; he states: “While there have been efforts to use integrated hydro-economic models, the practical limitations of these approaches have become apparent. Main difficulties with having overall, catchment scale approach evaluating different measures options are the upstream-downstream interrelations of effects of measures, difficulties concerning the assessment of measures concerning hydromorphology and diffuse pollution.”

4.2.1.10 Transaction costs

Transaction costs like administrative costs, information costs, reporting/monitoring costs, negotiation costs and compliance costs, which are generated by the implementation of the measures, are only sometimes, and often only partly, considered in the CEA process. In England & Wales, some of these costs were taken into account under the “delivery mechanism” costs of a measure. In Sweden, administrative costs to authorities and municipalities were estimated at national and district scale, but they were usually not directly considered in the CEA process. Methods to break down such costs and relate them to individual measures were lacking.

4.2.1.11 The case of France

Several CEA (with or without the calculation of a CE ratio) were carried out by French Water Agencies at local level (e.g. : “*Gestion de la nappe éocène sur le bassin Adour Garonne*”, “*Gestion de l'espace de Mobilité de l'Adour*”, “*Gestion des marais de l'estuaire de la Gironde*”, “*Programme de Mesures du bassin Seine Aval* », “*Etude ACE sur l'ouest Hérault*», “*Analyse comparative sur le bassin international de l'Escaut*», ...) (see also the box “Figure 14” below).

However, such CEA were not developed in a systemic manner, on all sub-basins to build the PoM 2010-2015. The main reasons for that are the lacks of proper data (e.g. quantified effectiveness of measures) but also the fact that the experts working on the measures in the Water Agencies⁹ are not used to formalise CEA. In other words, comparison of costs and effects of alternative measures are often made when designing the program of measures, but in they are not formalised in a CEA. Measures having effects on different environmental issues, lack of alternative measures to be compared were also mentioned by the experts interviewed. Thus, given the resources they add in terms of time and data, the Water Agencies used for many basins another method based on stakeholders and local expert participation combined with own experts. A list of measures coming from a national database (“Thesaurus”) were submitted to the local groups, who, based on their knowledge of the local socio-economic and environmental context, built a first draft PoM. The balance between cost

⁹ In France, the Water Agencies are in charge of building the PoM and River Basin Management Plans (RBMP) at Water District level

and effectiveness of the different measures was made at this first step. But cost and effectiveness were not the only parameters taken into account to select the measures and some of them were selected or excluded from the draft PoM because of acceptability or technical feasibility issues (the approach is then closer to Multi-Criteria Analysis). Indeed, most experts are used to consider a measure for a given issue and are not used to have a broad approach that considers several measures for a given issue as in a CEA. In some cases, in particular in the Seine Normandie RBD, different combination of measures allowing to achieve Good Ecological Status within different time frames were compared in terms of costs and financing and used as a tool to help decision making (see box “Figure 14”).

The draft PoM was then submitted to the Water Agencies experts who completed the documents for the missing information (quantified costs, etc.).

CEA are also used by water agencies to evaluate their policies in some fields (see box “Figure 14” below).

CEA for the SAGE Estuaire Gironde (Adour Garonne)

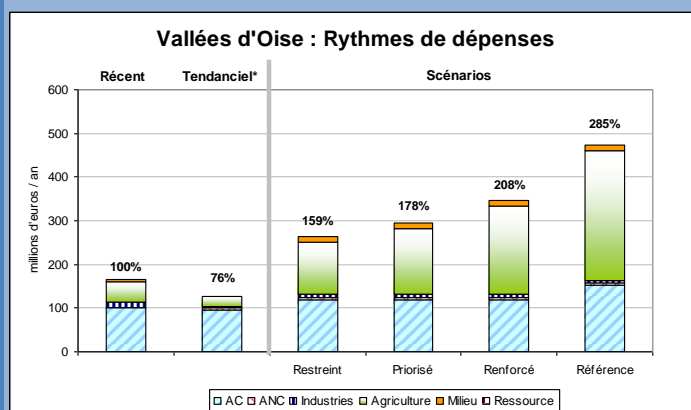
A CEA with a CE ratio has been developed as part of the economic analysis of the SAGE Gironde in order to help the decision-making regarding the passage of migrating fish. The CEA results allowed to confirm in particular the interest of the "eel plan" option. Completed by a Multi Criteria Analysis (considering the classification of the fishing stakes, the level of pressures and the organisation of actors in the catchment basin), the study proposes a prioritisation of actions relative to the ecologic continuity of the rivers of the SAGE.

CEA evaluating political intervention (water agency Loire Bretagne)

In 2009, the AELB has undertaken an evaluation of its finance policy of actions linked with the water economies in the basin. Many data are available and quantified in the study regarding actions' costs and effectiveness and some ratio are calculated (for instance, m3 water saved per € invested by the Agency). However, cost effectiveness ratio are only compared from a qualitative point of view in the conclusive part, but not explicitly calculated and compared with each other (see figure)

	Coût	Efficacité	Durabilité	Eco potentielle (volume)
MAE (simulation)	€€€	++++	++	
Retenues	€€€€	+++	++++	++++
Optimisation de l'irrigation	€€	+	++	
Changement d'assolement volontaire	0/€	+++	+	
Etudes diagnostics et patrimoniales	€€	+++	+++	
Compteurs sectoriels	€€ / €€€	+++	++++	++
Sensibilisation	€	+	+++	
Travaux d'économies d'eau (bâtiments)	€€€	+++	+++	
Recyclage des eaux usées	€€	++	+++	+
Récupération de l'eau pluviale	€€	+	++	

Comparison of measure combinations in Vallées d'Oise



In 2006 and 2007, while designing the PoM for the in the Vallées d'Oise sub-basin (managed by Seine Normandie water agency), different combinations of measures regrouped in scenarios were compared. These scenarios differ in their speed and their level of contribution to achieve good status. The comparison of costs of these scenarios regarding their objectives has provided support for the committee of the basin to build the final PoM.

Figure 15. Examples of CEA in France

4.2.2 Institutional, cultural, scientific, human and financial preconditions

4.2.2.1 Institutional capacity

The second part of the questionnaire dealt with the institutional dimension of the CEA and the first question asked whether there is enough personal/institutional capacity to carry out a CEA in the respective countries (referring to national and sub basin level). Here, clear divisions can be found: In the UK, Netherlands, Spain and other Western European countries the interviewees considered that there is enough capacity at least on the national level. On local levels the situation is at times different as in Norway, where economists were needed for supporting the work at the water district level. In Finland and smaller countries like Luxemburg, Cyprus and in some Eastern European countries there is a significant lack of personal capacity to carry out CEA at the national as well as sub basin level. In Slovenia, mainly the experts in the field of the water management economics are missing. In Sweden the capacity is there, but room for improvement is seen to lie in the right kind of methods and decision support systems in place. Then the CEA could be carried out by county administrative boards themselves and they would be less dependent on direct support from e.g. environmental economists.

4.2.2.2 Communication deficits

Horizontal and vertical communication deficits in and between relevant institutions and organisations were quite often addressed in the interviews, at least partially. In the Netherlands the non-hierarchical cooperation between national level and regional water boards was sometimes problematic because the regional level wasn't always keen on the advice from the ministerial level. In the German state of Schleswig-Holstein convincing people to help the work and making them aware of the CEA economic approach was stated to be difficult. CEA application in Lower Saxony required a huge effort in communication. Norway has seen lack of communication between district level and national authorities as well as coordination deficits between the CEA undertaken in the different water districts. In Sweden, horizontal and vertical deficits were mainly perceived according to methodology and values in the CEA practice. In Slovenia, communication was quite poor at the beginning of the WFD implementation process but improved with a better knowledge of the WFD requirements. In Hungary, there is an inappropriate allocation of decision rights, specifically lack of subsidiary, which gives no place to subsequent financial planning at lower level of the state administration. So there is no real interest to use CEA results as stake-holders are not the cost-bearers. And without clear interest in a development process there is no efficient multi-criteria planning. In Denmark, the fact that the WFD was part of the Green Growth plan made the process more closed to all except the ministries involved. In the Czech Republic vertical deficits were highlighted.

4.2.2.3 Openness for innovative economic instruments

The next question investigated whether the relevant institutions are open for innovative economic instruments brought in from the EU. Here, the answers were generally quite positive, e.g. in UK. In Sweden, innovative EU instruments are at times even requested. The fact, that CEA improves efficiency and practicality (which is of interest to any administration) was highlighted by other countries like Spain and Norway as well. In some Eastern European countries, resistance on local level (concerning new views on water management policy promoted by the WFD) remains, due to complicated WFD requirements.

4.2.2.4 Cultural perception

The questionnaire also addressed if there is a cultural perception in favour of this kind of economic tools which was affirmed by UK, Sweden, Netherlands, Ireland, Denmark and Spain while most other countries found reservations to economic approaches. In Germany and Austria too, the cultural perception for instruments such as CEA was not seen as developed enough.

4.2.2.5 The case of France

A reason for not implementing CEA in France is, like explained earlier, the unfamiliarity of the method as it has not been used during the last decades to select measures. However, the economists interviewed were unanimous to say that most technical experts (i.e. non economists) would not be reluctant to participate in a formal CEA. Indeed, this tool seems to be much more accepted by the non economists than for instance a Cost Benefit Analyses. However, the experts interviewed highlighted some limits of the CEA. In particular, CEA should not be used to replace public consultation nor the role of water managers at local level which remains a relevant and essential level for decision making.

The Cost-Effectiveness Analysis has for the last number of years been an integrated part of the policies in Denmark. The Danish approach can be defined as thorough (see figure 15) and pragmatic, supported by political will. The government has put much effort into the application of the CEA and also the treasury has made it an important element in implementation of policies. CEA have been used to a large extent in the WFD implementation so far. As one of the few countries DK have actually carried out ex-ante and ex-post analysis of cost effectiveness with respect to measures in the Action Plan II 1998 – 2003. The following aspects characterise the Danish approach:

- The use of CEA in Denmark at the national level has shown that cost-effectiveness ranking can provide the basis for decisions, but the final choice is a political decision.
- Denmark expresses the gap to the environmental target in terms of tonnes of N or P with respect to the targets in the Fjords and the lakes. For the streams the focus has been on physical conditions. This has made it possible to conduct a more normal CEA analysis as there has been one effect parameter.
- It is seen as important to make a clear link between the objective and the means for a given measure.
- The administrative implementation of a given measure can change both cost and efficiency.
- Administrative costs have been analysed in detail.
- Two main types of costs have to be assessed, the social (welfare) costs and the financial (budgetary) costs whereas it is important to describe exactly how the costs are calculated.
- Standard costs and income changes will be included (both running costs and investments).
- Side effects, additional effects (e.g. CO₂) and other benefits are included in the calculations.
- The process has been to present a national list of measures, choose the best and analyze them in more detail.
- Whether the measures can be controlled is an important factor in the final CEA analysis.
- That CEA analysis at the River Basin Level is a long process which is evaluated several times.
- A step-by-step procedure is recommended to reach a cost effective River Basin Plan which is also transparent for stakeholders.

Sources: Interview with Brian Jacobsen and Jacobsen (2007).

	WATECO	UK	DK
Direct costs	Included	Included (financial costs)	Included (budgetary costs)
Adjustment for subsidies and taxes	Perhaps Included	Included	Included
Price adjustment (factor price -> consumer price)	Not discussed	Not included	Included
Consumer surplus	Not explicitly included	Discussed but not included	Included
Administrative costs	Perhaps	Discussed but often not included (regulatory costs)	Discussed but often not included
Associated non-water environmental costs and benefits of measure	Included	Included when possible	Included to some extent
Wider economic effects in other sectors (income and jobs)	Partly discussed	Discussed but often not included	Discussed but often not included
Total costs is named	Economic costs	Economic costs or Social costs	Welfare economic costs

Figure 16 Summary of costs included in different descriptions of the economic/welfare economic costs in CEA

4.2.3 Level of integration in the decision making process

4.2.3.1 CEA and decision-making process

The first question in the third section asked how the results of the CEA have been taken into account in the decision making process of the final PoM and if CEA was an integral part of the measure selection. The answers were diverse, sometimes even in one country. In UK, one expert saw CEA as an integral part of measure selection which is used for decision making although some irrational hindrances exist (politics/lobby etc). It was perceived by another expert interviewed from the UK that nothing was done outside the much centralised preliminary CEA, so that the issue has largely not arisen. In the Netherlands, depending on the water board approach, the use of CEA for decision making has sometimes been lacking. It was heard in a number of cases that for the selection of measures several criteria were used, not only the CEA. In Germany, the CEA is generally seen as an integral part of the measure selection although the extent varies depending to the handling in the 'Länder'. CEA was not relevant in the urban and agricultural sector in Austria as only few new measures have been applied and those have been defined in the context of the urban wastewater and nitrate directive. However, hydromorphological activities profited from the CEA as it made the overall cost of the proposed action transparent which resulted in a new funding scheme. It also allowed a more qualified discussion with stakeholders. In Latvia, the CEA was the starting point in the process of the selection of measures. Some measures were laid aside, because their seemed to be disproportionate due to lack of financing (because there are other measures that are in priority). In the Czech Republic, the most effective set of measures was based on expert judgement, which took into account EU legislative requirements (incl. CEA), significant water use problems and the status of the water body. In Hungary there was not a CEA conducted for every water body, or problem. In Cyprus, the results of the CEA together with the relevant budget, defined the final PoM. In Spain, the results of CEA tend to be taken into account for decision making within organisations but to a much lesser extent across different organisations, due to institutional independence and specific interest pursued by different organisations. The awareness of this situation has limited to a certain extent the disposition of water planners to carry out CEA during the elaboration of the RBMPs. In Denmark, CEA was an integrated part of the Green Growth plan, which focused very much on synergies and cost effectiveness. The search for synergies meant a longer decision process. The fact that the Danish treasury was involved as chairman also ensured the CEA focus. In Sweden, the CEA has only partly been an integral part of selection of measures in the PoM. In Norway, CEA has been used, when conducted.

4.2.3.2 Non-use of CEA results

The reasons why measures proposed by CEA are not used can be grouped in two main sections:

- Budget limitations

This was mentioned in many countries but not only amongst poorer EU countries. Rather budget limitations and disproportionate costs¹⁰ were an issue for countries as varied as UK, Norway, Hungary, Slovenia, Spain etc.

- Political acceptability

This reason was mentioned a lot (UK, Slovenia, Luxemburg, Czech Republic, Finland, Denmark). In Sweden, it was apparent that some lobbies have managed to affect decision-making, both at the regional and national level. In Spain the institutions carrying out measures are to a certain degree autonomous and decide on the sequence to implement measures following their specific interests.

Time constraints and inconsistencies of results with scientific evidence or expert judgement were also mentioned, although not so frequent. Further aspects were legal hindrances for the practical implementation of some measures selected by CEA and feasibility to conduct measures. The importance of CEA as decision criteria was put into perspective in Germany, where in all cases the selection of the measures was based on various arguments; CEA being one out of several.

4.2.3.3 Transparency

The next point addressed was if CEA was used in a transparent way for decision-making (when conducted). Here, the answers were rather positive. An interesting remark came from the Danish expert who said that CEA activities from the different member states should not be judged from the water plans alone but also by the work which has gone on beforehand. In Denmark itself the use of the CEA in the decision making process was relatively transparent although the final phase was in the Green Growth group. In Spain and the Netherlands the answer was depending on the situation in each river basin district where the CEA has been conducted. When applied, it certainly contributed to make decision-making and the development of the PoM more transparent. In Sweden, the result of the CEA and other information has been available on web-sites and presented in hearings for the construction of the PoM.

4.2.3.4 Help for decision-making

When asked, if it was perceived amongst the relevant institutions that the CEA approach helps the decision-making, the responses were dominantly positive. Either, the institutions are used to evaluation and economic approaches (Netherlands, UK, Luxemburg) and/or they welcome analytical tools because they are positive to establish a basis for decision making (Spain, Austria). In the German state of Schleswig-Holstein CEA is seen as an important tool

¹⁰ In the case of disproportionate costs a CBA is envisaged

for using financial resources most efficiently and for setting priorities. The CEA was perceived to have helped in Denmark but when moving from national perspective to actual legislation some groups always find that they are hit hard. In Sweden, it was remarked that the CEA and its results seem overly technical and do not encompass all the costs and effects that are relevant to consider in decision-making. In Norway the views on this question differ: While some think that it is helpful, others think that it is just an academic exercise and that the measures would have been carried out anyway. In Eastern Europe the reaction was also mixed.

4.2.3.5 Outlook on CEA use

Finally, it was asked if a CEA-use is planned for the selection of the measures in the second RBMP in 2015. Here, the answer is mainly yes. In UK the process will be improved perpetually as there has been quite a widespread recognition of the disappointing first round approach (the UK government was taken to court by the WWF over the implementation of the WFD), and a desire to do things better. In the Netherlands, new developments in the water boards¹¹ organisation are envisaged to improve the application of the CEA. In the German states of Schleswig-Holstein and Lower Saxony CEA is seen as a useful tool and no changes are foreseen. The most challenging issue is not the CEA but changing circumstances that affect the effectiveness of certain measures and new agricultural developments. In Austria, CEA will be started at an earlier stage in the planning process to get a better estimate of the costs. In the case of agriculture a more regional CEA approach seems to be more appropriate in the long term in order to better develop regional funding schemes. More works is envisaged in the case of hydromorphology to better understand the effects of a measure. In Slovenia there is an intention to use the CEA for the selection of measures in the second RBMP although the preparation of the first RBMP proved that other circumstances can play a great role like prioritisation of measures according to a certain criteria and availability of finances. Progress is expected in form of a better understanding of the effectiveness of the measures in Luxemburg, while in Cyprus improved knowledge of the hydro-geological status of the water bodies will enhance the ability to estimate costs and benefits of relevant changes. In Norway, better support is envisaged by providing data for the local analysis and more detailed guidance since CEA is mainly undertaken by non-economists in the water districts. The increasing data gathered at the national level will help local water district officials. In addition to this, training courses are important to give the people working with CEA in the water districts enough knowledge to carry out these kinds of analysis. There is also more research on the national level in Sweden, Denmark and Scotland. However, in Sweden, development of the methodology will be the focus. Finally, the institutions are by now more familiar with the CEA and should be more responsive.

¹¹ Stronger involvement of political parties in the water boards with a different political culture of trade-off that is conducive to economical approaches like the CEA.

4.2.3.6 The case of France

In France, CEA were carried out at local level but not systematically to design the Program of Measures. The interest for this type of analyses is however clearly seen, not only by the Water Agencies economist but also by other experts and decision makers.

Water agencies and ONEMA are currently into a process (to which this study belongs) to discussing the role of CEA and most adequate methods to use it for supporting the building of the next PoM. One of the main issues concerns the adequate scale. Indeed, some experts think that CEA has to be conducted to make choices between measures at local level, using models to estimate the effectiveness of the measures. For others, CEA should first be made at national level to help choosing the important directions (e.g. a tax or a regulation to address pesticides pollution?) and then at more local level to adapt the general measures to the local context (e.g. extending the network to collect waste water from a rural area, building a new waste water treatment plant or develop individual waste water treatment?).

5 CONCLUSION AND MAIN OUTPUTS.

In the interviews it became clear that there is a quite diverse application of the CEA in Europe. Some countries have put much effort into methodology and databases (these tend to be in North West Europe plus Spain) while other countries have little use of the instrument (more in South and East Europe). Many countries chose a more general strategy (generic data) in order to address the issue of cost effectiveness but without applying it in every river basin district.

In a previous EU report (EC DG ENV, 2010), the undertaking of a cost-effectiveness analysis has been reported in about 2/3 of the RBMP. After this research the number can be contested. Only sometimes a proper CEA could be found in a RBMP while there are many cases where the RBMP mentions a CEA without actually displaying it. In this respect, transparency of the CEA use is an issue.

In a way the limited display of CEA reflects the authorities' difficulties with the application of the tool. These difficulties mainly lie in the 'multi'-faced issues that have to be considered when conducting a CEA. Apart from technical questions, a meaningful CEA requires a receptive procedural institutional and governance context, where information is exchanged and provided to guarantee some degree of sound data and objectivity.

The main constraints can be summed up in the following points:

- **Data availability and uncertainty**

Even though models and pilot studies are being developed, data gaps about costs and especially effectiveness of the measures are still perceived. Either they are unknown or too costly to generate. The analysis of costs and effects of measures in various sectors and locations is in itself already a challenging task. The main constraints lie in estimating costs and especially effectiveness of measures taking in consideration the complexity and durability of ecological processes including upstream/downstream dynamics. Due to the large variety of pressures and impacts on water bodies, a wide range of measures must be applied at different levels (from measures that take effect locally to ones that address the whole river basin level). As a result, the development of a CEA will need to take this gap between local scale and river basin level approaches into account. This has not always been the case.

The CEA also requires close co-operation between economists conducting the CEA and technical experts who have to provide the relevant information about the

effectiveness of measures to be tested and compared. This link has also not always been working sufficiently.

- **Governance issues**

Applying CEA in for a PoM necessarily involves cross-level (international river basin, river basin, river basin district, water body) coordination of government bodies, some of them independent (like the regional water boards 'waterschappen' in the Netherlands). This has been the cause for insufficient application of CEA and some inconsistency of approaches and results. Furthermore, besides the cost effectiveness of measures, other parameters for decision making became clear: acceptability of measures for stakeholders, administrability and checkability for governments. Participation of stakeholders is still expandable.

- **Cultural and institutional constraints**

Many technical experts are not used to the CEA approach and find difficult to consider a board choice of measures. Resistance exists in some institutions to an economic approach.

Improvements for the next round of RBMP

It became clear however that these issues are addressed in many countries and that there is research underway to improve the methodology and application of the CEA. The interviews indicated that CEA (in the WFD) is in a process of being adapted by institutional systems, science and process organization and coordination bodies. Apart from efforts to advance the data situation, countries endeavours are also directed to enhance the embeddedness of CEA in the site context. This is based on the understanding that the CEA is just one of several requirements for the PoM and that it can never be the sole base for choosing the right and feasible measure in each location. As one Swedish RBD responsible¹² put it: "Even if the RBD authorities manage to improve the quality, reliability and transparency of CEA in PoM, there remains the considerable effort to communicate the results and make them applicable for those who actually shape policies and implement the measures in practice. CEA may act as a good supporting tool to communicate complex information and lay ground for effective decision-making. There remains some work to make CEA results acceptable as reliable input in decision-making, particularly on the local scale." This is already practiced in various countries, e.g. in parts of Germany, where measures are not only selected based on the CEA results (see Figure 10). The reason for this multi-criteria approach, as stated in an interview, can be explained by the fact that Germany aimed to develop *realistic* PoM that can be implemented on the ground. Summing up we can say that the CEA application in the WFD is in the process of establishing itself.

¹² Dag Lestander, Competent Authority of South Baltic River Basin District, Sweden

6 BIBLIOGRAPHY.

Berbel et al. (2010). A Cost-Effectiveness Analysis of Water-Saving Measures for the Water Framework Directive: the Case of the Guadalquivir River Basin in Southern Spain, in: <http://www.springerlink.com/content/101x45nt46683h81/fulltext.pdf>

Dworak, T., Pielen, B. (2006). , Selecting cost effective measures under the EU Water Framework Directive – The issue of scale, in: http://www.feem-web.it/nostrum/db_doc/Dworak.pdf

European Community (2000): Directive 2000/60/EG

European Commission DG ENV (2010). The Water Framework Directive Common Implementation Strategy, in: http://www.wsstp.eu/files/WSSTPX0001/pilot/agriculture/bufferzonesworkshop/1-DG_Env-N_Rouyer-230210-WssTP_buffer_strips-zones.pdf

Interwies, Eduard (2007). Current use of Economic Methods and Models for the Implementation of the WFD in selected EU-Member States: the role of European research, in: http://www.google.fr/url?sa=t&source=web&cd=2&ved=0CClQFjAB&url=http%3A%2F%2Fwww.harmoni-ca.info%2FRegistered_Users%2FDocument_Store%2Fdocs-doc-open-download.php%3Fdoc_id%3D794&rct=j&q=Current%20use%20of%20Economic%20Methods%20and%20Models%20for%20the%20Implementation%20of%20the%20WFD%20in%20selected%20EU-Member%20States%3A%20the%20role%20of%20European%20research&ei=n-cATcHPBsKh8QOf8pWbCA&usq=AFQjCNG4Hfje2S3qVM38hSYjxncYyWVduQ&sig2=RIR5l0onN9fvuj4yaXZ9rQ&cad=rja

Jacobsen, Brian (2007). In search of cost-effective measures. IFRE, Copenhagen

Niedersächsisches Ministerium für Umwelt und Klimaschutz (2010). Hintergrunddokument Nachweis zur ökonomischen Anforderung der Kosteneffizienz von Maßnahmen gemäß EG-WRRL für das Niedersächsische Maßnahmenprogramm bis 2015. Publication Lower Saxony Ministry of Environment and Climate

Socopse/Ducos, Géraldine (2009). Emission Reduction Strategy Report, in: <http://www.socopse.se/download/18.3cd20f1b1243376c1168000572/ERSR.pdf>

Van der Veeren, Rob (2008). Different cost-benefit analyses in the Netherlands for the European Water Framework Directive, Rijkswaterstaat Publication